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# Critical reflections on German Red Lists of endangered myriapod species (Chilopoda, Diplopoda) (with species list for Germany)

Karin Voigtländer[1], Hans S. Reip[1], Peter Decker[1], Jörg Spelda[2]

**1** *Department of Soil Zoology, Senckenberg Museum of Natural History Görlitz, P.O. Box 300154, 02806 Görlitz, Germany* **2** *Section Arthropoda Varia, Bavarian State Collection of Zoology, Menzinger Straße 71, 80638 Munich, Germany*

Corresponding author: *Karin Voigtländer* (karin.voigtlaender@senckenberg.de)

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## Abstract

The Red Lists of endangered species published by the German Bundesamt für Naturschutz (BfN - the Federal Agency of Nature Conservation) are essential tools for the nature protection in Germany since the 1970s. Although many groups of insects appear in the German Red Lists, small and inconspicuous soil organisms, among them millipedes and centipedes, have in the past been ignored. In the last few years great efforts have been made to assess these two groups, resulting in Red Lists of German Myriapoda. However, difficulties were encountered in strictly applying the Red List classification criteria to myriapods. Here we discuss those problems and some sources of error. A species list of all German Diplopoda and Chilopoda including Red List status and frequency of occurrence is provided in an Appendix.

## Keywords

Red List, Chilopoda, Diplopoda, Germany, protection, assessment

## Introduction

The basis of all protection measures are studies of the distribution and endangerment of species and habitats. For this purpose the so-called "Red Lists" are expert scientific reports which document and evaluate the current degree of endangerment on the basis

of population size and population dynamics (vulnerability analysis). They indicate a (possible) need for conservation actions and have other useful functions (Figure 1). Red Lists are essential instruments for environmental planning and assessments and are publicly available statements of expert opinion (Schuboth and Peterson 2004). Hardly any other scientific publication has the political consequences of a Red List. Endangered species Red Lists were prepared for the first time in 1963 (IUCN Red List of Threatened Species). In Germany nature protection practice has operated with Red Lists since 1970.

In South Africa and Australia, conservation decisions may be based on endangered myriapod species (mostly short range endemics) (Hamer et al. 2006, Hamer and Slotow 2009, Framenau 2011, Pfab et al. 2011). The current international Red Lists of the International Union for the Conservation of Nature (IUCN) includes only a few Myriapoda: *Scolopendra abnormis* from Mauritius and 31 species of *Doratogonus* from South Africa. In recent years some European countries have published national Red Lists including myriapods: Slovenia (Kos 1992, Mrsic 1992), Czech Republic (Kocourek 2005) and Norway (Djursvoll and Meidell 2006, Djursvoll 2010).

To enable myriapods to be considered in German conservation planning, the authors prepared Red Lists for German Chilopoda and Diplopoda between the years 2005 and 2010 (Spelda et al. in press, Reip et al. in press). In the present paper we summarize the resulting Red Lists and discuss some difficulties and problems we encoun-

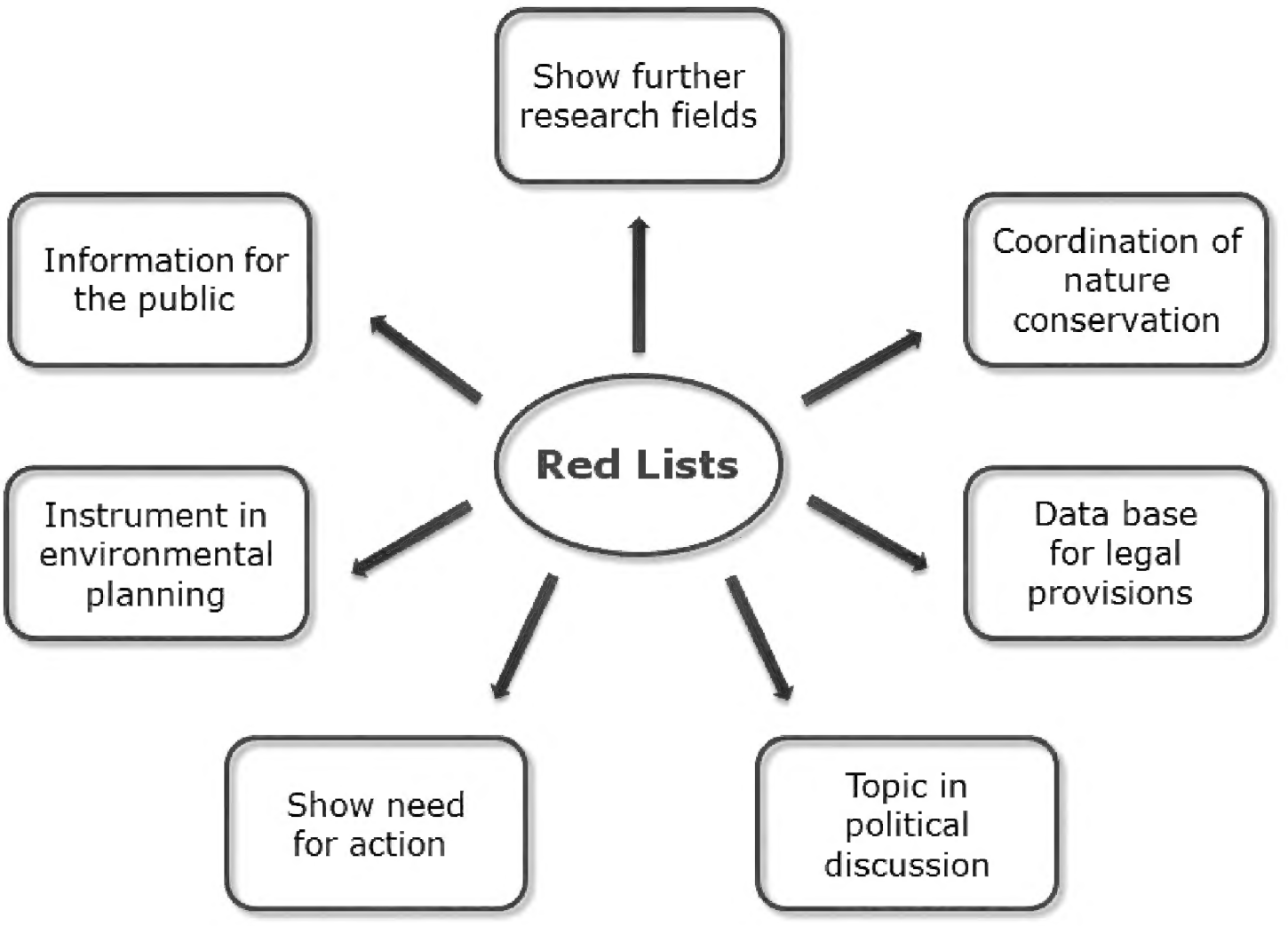


**Figure 1.** Uses for Red Lists.

tered during the assessment process. For the details of the classification and categorization protocols used in that process, see Spelda et al. (in press) and Reip et al. (in press).

## Red Lists in Germany

The Red Lists of Germany are edited and published by the Bundesamt für Naturschutz (BfN). They have recorded extinct, missing or vulnerable species of animals, plants, mushrooms and plant communities since the 1070s (e.g. DS/IRV 1971, Sukopp 1974). Since 1994 biotope types have also been listed (Riecken et al. 1994). The principles and methods involved in preparing Red Lists are frequently refined (e.g. Blab and Nowak 1989, Schnittler et al. 1994, Ludwig and Schnittler 1996, Ludwig et al. 2009a, 2009b). Up to the year 2009, 16,000 German animal species (vertebrates and selected invertebrate groups) have been evaluated for their degree of endangerment on the Red Lists. The proportion of German animal species not considered in the Red Lists to all German animal species is estimated to be 45% (Binot-Hafke et al. 2009), and among the unconsidered species are soil animals such as myriapods.

## Why list myriapods?

Although many groups of insects have been well-documented for many years, this is not the case for soil fauna (Dunger 1996). Most soil animals, including millipedes and centipedes, are small and inconspicuous. They are considered unattractive and attract little public interest. But in the last 20 years the approach to these animal groups has clearly changed. Proposals of Red Lists have been made for isopods by Grünwald (1990) for the federal state of Bavaria and by Knorre (2001) for Thuringia. For diplopods and chilopods, lists were established by Spelda (1999, 2004) for Baden-Württemberg and Bavaria as well as by Voigtländer (2004a, 2004b) for Saxony-Anhalt. This change followed passage of the soil protection law in 1998 (BBodSchG 1998), which explicitly demands the protection of soil as habitat for mankind, animals and plants. As a result, the preservation of diversity and function of soil organism communities came into focus and the need to increase scientific knowledge of soil organisms had been recognized.

In contrast to many other Arthropoda, myriapods show a very low tendency to disperse. Even in Germany there occur several endemic species with very small distribution ranges. Furthermore, the German myriapod fauna shows remarkable differences east and west of an invisible boundary passing from the Harz Mountains over Regensburg south to the Inn as well as the Rhine Valley line (Figure 2). Another common distribution limit is the 200 m elevation contour, which runs crosswise through Germany and and separates the northern lowland fauna from the southern low mountain range fauna. Entirely different faunas occur in the far south of Germany, in the Alps and the Black Forest. Myriapods are thus particularly good subjects for biogeographical analyses.

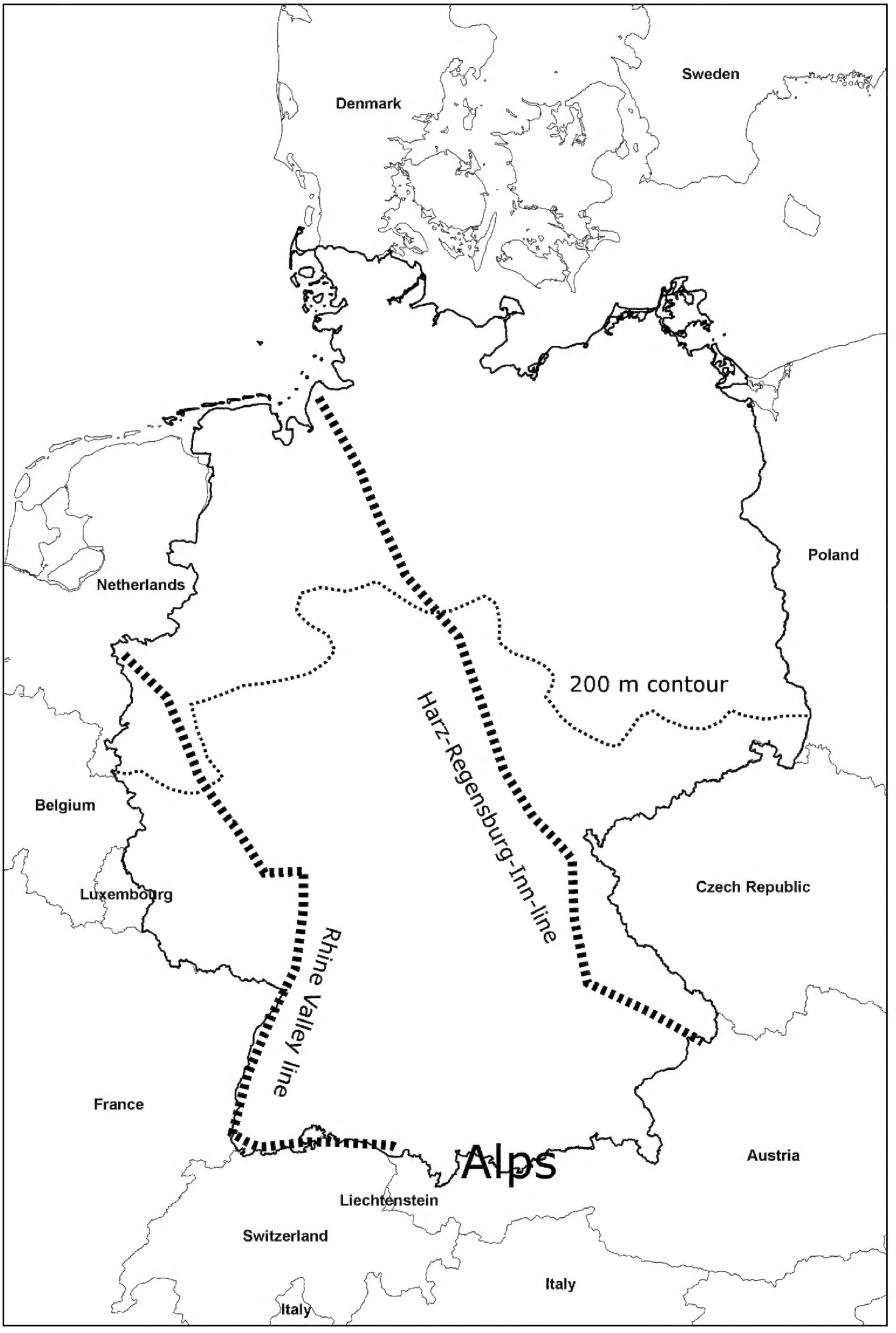


**Figure 2.** Shared distribution limits for myriapods in Germany.

Myriapods, especially the diplopods, are highly suitable for biological site-characterization (Römbke et al. 2000). There exist not only characteristic species for sites (Voigtländer 2003a, 2003b, 2005), but also site-typical communities with special species compositions and dominance structures (Ruf et al. 2000, Voigtländer and Düker 2001, Voigtländer 2003c). Some species react very quickly to changes in environmental conditions, and are therefore valuable in monitoring the rehabilitation of disturbed sites (e.g. Dunger and Voigtländer 2005, 2009).

A final reason for improving the conservation status of Diplopoda and Chilopoda through Red Lists is that they are regarded as "living fossils" (Edgecombe 2010, Shear and Edgecombe 2010) and hence have an intrinsic as well as a utilitarian conservation value.

## Background

### Evaluation process

Although the application of the Red List protocols to myriapods is detailed elsewhere (Spelda et al. in press, Reip et al. in press), we offer here a brief overview as background for the discussion that follows.

The methods and procedures for Red List assessments are fixed by the BfN (Ludwig et al. 2009a). They deviate in some respects from the IUCN method (IUCN Standards and Petitions Subcommittee 2010) because these rules are not completely applicable on a national basis. A critical review of the IUCN methods in respect of national requirements and their consequences is given in Haupt et al. (2009).

To get comparable results for all assessed German species groups it is not possible to modify methods greatly. In previous years, species vulnerability and degree of endangerment were evaluated with the help of defined categories, based on various quantitative criteria. Now the procedure has changed so that the criteria and their definitions are in the foreground. The new method is described in Ludwig et al. (2009a).

Four criteria are used for vulnerability analysis:

1. current situation of population size and distribution,
2. long-term trend of population size and distribution (25 to >100 years),
3. short-term trend of population size and distribution (less than 25 years),
4. risk factors.

Standardised classes for each criterion are introduced to make the classification more understandable and verifiable.

In contrast to most other countries and previous versions of Red Lists, the BfN has demanded a complete list of all German diplopods and chilopods and an assessment of their current status (see Appendix). For the analysis several parameters have to be considered (population size, number of occurrences, grid or areal data, habitats).

For myriapods the key data would be the number of occurrences and if available the population size and habitats. Six frequency of occurrence classes can be distinguished (extremely rare, very rare, rare, moderately frequent, frequent, very frequent) which are supplemented by the classes "extinct or lost" and "unknown".

The short– and long–term trend criteria enable the consideration of changes of the population size over the time. By a comparison of both trends the reliability of the results of the Red List is increased. If the number of records is not very large, an evaluation is also possible by using only one trend criterion, either short- or long-term. In taxa with large and irregular fluctuations within populations the short-term trend criterion should be ignored. For the long-term population trend of myriapods we compared the situations before and after 1950. Species recently added to the German fauna are classified as "data insufficient" for this criterion.

If it is well-established that the population of a species will decline during the next 10 years, risk factors have to be considered. The prospective effect of risk factors rather than the total number of factors should be of greater importance for the overall evaluation.

Importantly, the method of Ludwig et al. (2009a) also measures national responsibility, by evaluating the endangerment status of a species over the whole of its range, and not only in Germany.

## Procedure of classification

The classification of degree of endangerment (categories) is determined by a standardised classification scheme set by the BfN (see Ludwig et al. 2009a) which operates in a constant and uniform manner for all species. After data input, a spreadsheet provided by the BfN calculates the endangerment levels automatically and carries out consistency tests for the core information entered.

## Data acquisition

The myriapod Red Lists are based on an ongoing and systematic recording of the German myriapod fauna by the Working Group of the German Speaking Myriapodologists (http://myriapoda.info/agdm/agdm.htm). Evaluations are based on species lists from more than 5,500 localities (often with several investigated habitats in each) from 1960 to 2010. Altogether over 150,000 specimens were considered. Additionally, a part of the myriapod literature of Germany was examined, and species lists from over 1,000 locations were added to the analysis. For details see Spelda et al. (in press) and Reip et al. (in press).

There was insufficient data for an evaluation of Symphyla and Pauropoda, due to a lack of experts, collections and current investigations. There are no indications the situation will change in the near future.

## Final tally of German Red Lists (Chilopoda and Diplopoda)

Altogether 61 centipede species and 136 millipede species (140 counting subspecies) were known in Germany in 2010:

| Chilopoda | No of spp. | Diplopoda | No of spp. (incl. subtaxa) |
|---|---|---|---|
| Scutigeromorpha | 1 | Polyxenida | 1 |
| Scolopendromorpha | 4 | Glomerida | 15 |
| Geophilomorpha | 24 | Polyzoniida | 2 |
| Lithobiomorpha | 32 | Chordeumatida | 37 (40) |
| | | Julida | 59 |
| | | Polydesmida | 21 (22) |
| | | Spirobolida | 1 |

Based on the BfN data sheet with all criteria evaluated, the tally of species considered endangered was 13% for Chilopoda and 21% for Diplopoda (Table 1):

**Table 1.** Tally of the species and Red List categories (modified from Spelda et al. in press, Reip et al. in press). Percentages rounded.

| | **Chilopoda** | | **Diplopoda** | |
|---|---|---|---|---|
| | absolute | percentage | absolute | percentage |
| **Number taxa established** | 61 | 100% | 140 | 100% |
| Neobiota | 8 | 13% | 16 | 11% |
| Indigenous species and archaeobiota | 53 | 87% | 124 | 89% |
| **Number of taxa in the different categories** | | | | |
| **0** Extinct or missing | 0 | 0% | 0 | 0% |
| **1** Threatened with extinction | 7 | 11% | 7 | 5% |
| **2** Highly endangered | 1 | 2% | 18 | 13% |
| **3** Endangered | 0 | 0% | 5 | 4% |
| **EU** Endangerment of unknown extent | 0 | 0% | 1 | 1% |
| **Sum of endangered species** | 8 | 13% | 31 | 22% |
| **R** Extremely rare | 7 | 11% | 21 | 15% |
| **Number of Red List species** | 15 | 25% | 52 | 37% |
| NT Near threatened | 2 | 3% | 4 | 3% |
| * Least concern | 36 | 59% | 67 | 48% |
| D Data deficient | 0 | 0% | 1 | 1% |

## Difficulties and their possible solutions

The present Red List of the German myriapod species has to be regarded as a first attempt at estimating degrees of endangerment for species in this neglected group. It is not surprising that difficulties exist, which we list below. In addition, we will provide some recommendations for further research.

## Population size

The assessment of some species is negatively affected by a lack of area-wide data. A clear division between the South and the North of Germany is obvious (Figure 3).

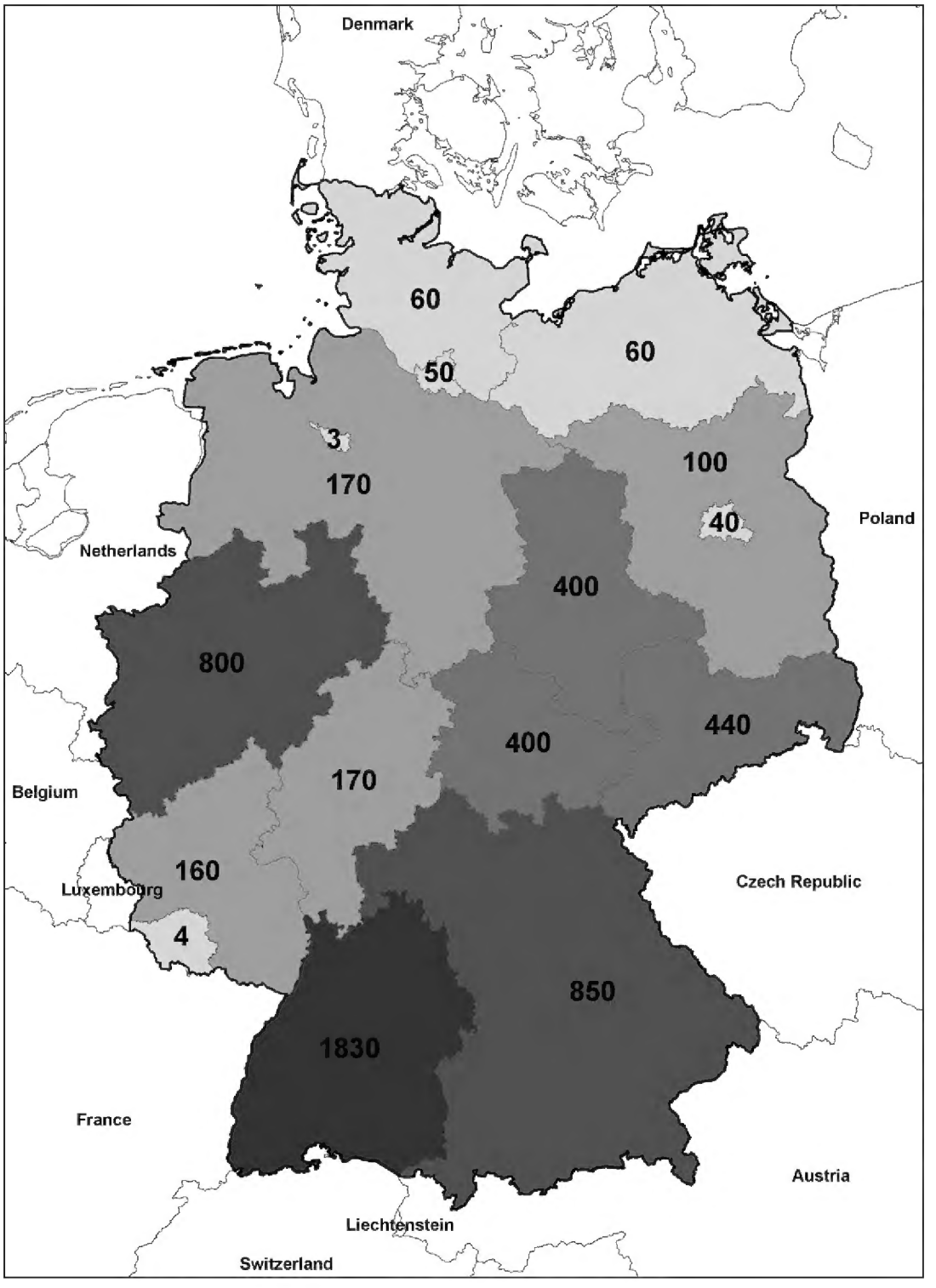


**Figure 3.** Approximate numbers of sampled sites in the federal states of Germany.

Most records are from southern Germany (Baden-Württemberg, Bavaria) in contrast to only a few records from the northern federal states of Schleswig-Holstein and Mecklenburg-West Pomerania. Recent records are particularly scarce in the last mentioned regions, e.g. for *Leptoiulus cibdellus*. These under-represented areas should be the focus of future sampling. Such observation gaps also existed in the past. Each of the "pioneers" of German myriapodology had more or less his own collection area, e.g. Verhoeff in southwestern Germany or Schubart in the northeast. This bias complicates the assessment of long-term trends outside these favoured areas.

Recommendation: During the assessment process each species must be studied and discussed in detail. This is done in depth in our Red Lists of German chilopods and diplopods (Reip et al. in press, Spelda et al. in press).

Often the number of available records does not allow the calculation of exact numerical terms for the criteria, e.g. if there are only sporadic records of single specimens or a few records in greater intervals.

Recommendation: Frequency classes should be established on the basis of accurate numerical ranges, if possible. When this is not possible, interpolation or expert opinion becomes relevant and legitimate.

## Population trend

At the present time it is not possible to provide a short-term population trend for any German myriapod species. It can be assumed, however that such a trend will often be overlaid by the natural range of fluctuation.

Recommendation: This criterion should be ignored (legitimately according to Ludwig et al. 2009a).

## Methods and procedure

The criteria for the analysis of endangerment can be effectively applied to many animal groups, but they are less suitable for Myriapoda. Given the small amount of data available for myriapods, strict use of these criteria has the result that one fourth of the German chilopod species and more than one third of the diplopod species should be Red Listed. The method of Ludwig et al. (2009a), as applied in the automatically calculating Excel spreadsheet provided by the BfN, produced in only a few cases the risk categories "EU" (endangerment of unknown extent) or "D" (data deficient). The assessment system does not allow the expert to override an assignment. For example, a species is automatically classified in the categories 1 to 3 if it is ranked as "extremely rare" in combination with certain other criteria states, whether or not the "extremely rare" ranking is based on an adequate number of records.

Recommendation: Doubtful cases needs to be discussed in the comments to the Red Lists.

## Uncertain taxonomic status

The taxonomic status of most German diplopods and chilopods is well established. In some species or species groups, however, the taxon's validity at the species level has been disputed or neglected in the past or is still uncertain. This results in incomplete or inaccurate knowledge of the distribution, trends and risks for these species. A careful taxonomical revision is needed for several questionable species or subspecies, e.g. the *Ochogona regale* and *O. triaina*, and *Ophyiulus major* and *O. pilosus*. When compiling the Red Lists, we found that historically misapplied species names (e.g. *Glomeris tetrasticha* and *G. connexa*) and closely related, easily misidentified species (in the *Lithobius lapidicola*-group, *Lithobius mutabilis*-group and *Geophilus proximus*-group) needed to have all records rechecked.

Recommendation: Taxonomic status needs to be discussed in the comments to the Red Lists.

## Capture methods

Standardised and appropriate capture methods are necessary. Pitfall trapping, sieving and hand sampling are regularly used for myriapods, but not all methods are equally suitable for all myriapod species in all habitats.

Recommendation: Sampling should include a wide range of methods, such as soil sampling or tree traps (e.g. for *Macrosternodesmus palicola*, *Propolydesmus germanicus* or *Lithobius pelidnus*).

## Missing species

For some species, there have been no records in Germany for 50 years or more, e.g. *Clinopodes flavidus*, *Polydesmus susatensis* and *Strigamia maritima*. These have been classified as "extremely rare" and not as "extinct or lost". It is possible that these species haven't been found again merely by chance. In one case, the millipede *Bergamosoma canestrinii*, a "lost" species was rediscovered in 2010 (unpublished data).

Recommendation: Targeted searches at known localities and in the surrounding areas are necessary to determine whether a species is really lost.

## Extremely and very rare species

In some cases "extremely rare" and "very rare" may be incorrect. If there are limited records, an overlooked population could have a major effect on the conservation status of the species, e.g. for *Haploporatia eremita*. A biotope or habitat evaluation derived from species with only a few records does not always reflect the real situation.

Recommendation: Targeted searches of the area surrounding known records and in equivalent habitats in other regions are necessary to improve knowledge of rarity. If the choice of "extremely rare" or "very rare" is unclear, the species should be classified as "extremely rare", because this increases the chances that the species will be given a high priority for further study.

## Loss of biotope or habitat

For many myriapod species, especially for diplopods, the loss of biotope or habitat plays an important role in endangerment classification. If a threatening event affects a species with a very small distribution area this implies the possible extinction of the species. In Germany this is the case with *Rhymogona serrata*. If the proposed High Rhine highway is built, a large proportion of the mere 100 km$^2$ distribution area of this extremely short-range endemic species would be destroyed. Germany has the greatest responsibility for the conservation of *R. serrata*, which additionally occurs only in a small belt in adjacent Switzerland near Basel. In the case of xeric or mesoxeric meadow-species a loss of natural or semi-natural sites is assumed to be caused by bush encroachment, afforestations, etc. Some elements of the Pannonian fauna reach their northwestern border in Germany, e.g. *Megaphyllum unilineatum*. Even though this species still occurs quite commonly in its main distribution area, local decrease on the western edge of the area is considered to be critical as shown by Spelda (1999).

Recommendation: In all cases, knowledge of the autecological requirements of species in relationship to their distribution area and also knowledge of possible alternative habitats is very important and should be studied. The following risk factors must be weighed: "direct human effects" (e.g. building measures), "loss of habitat", "re-colonisation hindered for species with a small distribution area which have not been rediscovered to date".

## Endemic species

In Germany, the number of endemic species is quite small (six species) in comparison to other European countries, e.g. Austria, 18 diplopods (Gruber 2009); Slovenia, 56 diplopods (Mrsic 1992); and Bulgaria, 23 chilopods (Stoev 2002). The German endemics are all Diplopoda: *Glomeris malmivaga*, *Pyrgocyphosoma titianum*, *Rhymogona verhoeffi*, *R. wehrana, R. serrata* and *Xylophageuma vomrathi*. All these species have a

very small distribution area in the Black Forest, the Swabian (Baden-Württemberg) or the Franconian Jura (Bavaria). Short-range endemism is a risk to a species and the risk can be increased if additionally the habitat of the species is endangered e.g. by human activity (see above for *R. serrata*).

Recommendation: Endemism is always strongly connected with national responsibility. The conservation of endemic species should always be considered in planning projects and substantial human activities. Therefore endemic and subendemic species should get the risk factor "resettlement under less favourable conditions".

### Distribution limits and national responsibility

Many species, including extremely rare species, have their distribution limits within Germany (Figure 2). For German species with a small distribution area within Europe, shared by different countries, the so-called subendemics, there is a high German responsibility for their protection, e.g. *Haasea norica*, *Pteridoiulus aspidiorum* and *Bergamosoma canestrinii*. For species more widely distributed in Europe, the German responsibility is lower: e.g. *Eupolybothrus grossipes* and *Schendyla tyrolensis*.

Recommendation: For assessing the level of national responsibility the whole of a species distribution area, its degree of fragmentation as well as local abundances have to be examined and evaluated.

### Alien species

Alien species are non-indigenous species that have been introduced by direct or indirect human activity since 1492 (Ludwig et al. 2009a). Among the myriapods, such species are often extremely or very rare, representing single introduction events or lack of data in urban areas. Alien species are included in the Red List, but they are not evaluated and therefore they do not get an endangerment status. In some cases it is not clear if a species is an alien or an indigenous species at its distribution limit, e.g. *Henia vesuviana* and *Stigmatogaster subterranea*.

Recommendation: If it is unclear whether or not a species is alien, it should be evaluated.

## Conclusion

We have prepared Red Lists for Diplopoda and Chilopoda as a first step in raising the conservation profile of these groups in Germany (Spelda et al. in press, Reip et al. in press; Appendix below). These lists are based on available knowledge and it became clear as we compiled them that we faced several "start-up problems" during the evaluation process.

However, lack of detailed knowledge (e.g. of distribution, frequency of occurrence, effects of contaminants) should not be allowed to hinder the compilation of Red Lists. German nature protection practices (environmental planning, surveys and reports) value biotopes according to their conservation status, which is mostly measured by the occurrence of Red List species. Without proof of existence of such species, funds may not be allocated for further studies in those biotopes. On the other hand, without these funds we cannot build an increased, detailed knowledge base of threatened species. This problem, however, must not lead to a deviation from clear scientific methods towards mere scientific politics. Results must always be replicable and well founded.

The work reported here shows that millipedes and centipedes are worthy of and in need of protection, and Red Lists provide nature conservation efforts with a powerful management tool for conserving these groups.

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## Appendix

**Table 2.** Species list of all German Diplopoda and Chilopoda including Red List status and frequency of occurrence (see Spelda et al. in press, Reip et al. in press for species discussion in detail).
Abbreviations for Red List status: 1 – threatened with extinction, 2 – highly endangered, 3 – endangered, EU – endangerment of unknown extent, R – extremely rare, NT – near threatened, * – least concern, ♦ – not evaluated, D – data deficient. Abbreviations for Species: + – endemic species, ~ – alien species. Abbreviations for Frequency of occurrence: er – extremely rare, vr – very rare, r – rare, mf – moderately frequent, f – frequent, vf – very frequent, ? – unknown.

| Diplopoda | | |
|---|---|---|
| **Red List status** | **Species** | **Frequency of occurrence** |
| R | *Allajulus groedensis* (Attems, 1899) | er |
| * | *Allajulus nitidus* (Verhoeff, 1891) | vf |
| ♦ | *Amphitomeus attemsi* (Schubart, 1934) ~ | ? |
| ♦ | *Anamastigona pulchella* (Silvestri, 1894) ~ | ? |
| 2 | *Archiboreoiulus pallidus* (Brade-Birks, 1920) | vr |
| * | *Atractosoma meridionale* (Fanzago, 1876) | vr |
| 1 | *Bergamosoma canestrinii* (Fedrizzi, 1878) | er |
| * | *Blaniulus guttulatus* (Fabricius, 1798) | h |
| R | *Boreoiulus tenuis* (Bigler, 1913) | er |
| R | *Brachychaeteuma bagnalli* Verhoeff, 1911 | er |
| * | *Brachychaeteuma bradeae* (Brölemann & Brade-Birks, 1917) | vr |
| ♦ | *Brachychaeteuma melanops* Brade-Birks & Brade-Birks, 1918 ~ | ? |
| * | *Brachydesmus superus* Latzel, 1884 | f |
| ♦ | *Brachyiulus lusitanus* (Verhoeff, 1898) ~ | ? |
| * | *Brachyiulus pusillus* (Leach, 1815) | mf |
| * | *Choneiulus palmatus* (Němec, 1895) | r |
| * | *Chordeuma sylvestre* C. L. Koch, 1847 | r |
| NT | *Craspedosoma rawlinsii alemannicum* (Verhoeff, 1910) | r |
| 3 | *Craspedosoma rawlinsii alsaticum* (Verhoeff, 1910) | vr |
| * | *Craspedosoma rawlinsii rawlinsii* (Leach, 1815) | f |
| R | *Craspedosoma taurinorum* Silvestri, 1898 | er |
| ♦ | *Cylindrodesmus hirsutus* Pocock, 1889 ~ | ? |
| 1 | *Cylindroiulus arborum* (Verhoeff, 1928) | er |
| * | *Cylindroiulus boleti* (C. L. Koch, 1847) | vr |
| * | *Cylindroiulus britannicus* (Verhoeff, 1891) | r |
| * | *Cylindroiulus caeruleocinctus* (Wood, 1864) | vf |
| * | *Cylindroiulus fulviceps* Attems, 1900 | vr |
| * | *Cylindroiulus latestriatus* (Curtis, 1845) | mf |
| R | *Cylindroiulus luridus* (C. L: Koch, 1847) | er |
| * | *Cylindroiulus meinerti* (Verhoeff, 1891) | r |
| 1 | *Cylindroiulus parisiorum* (Brölemann & Verhoeff, 1896) | er |
| * | *Cylindroiulus punctatus* (Leach, 1815) | mf |
| R | *Cylindroiulus salicivorus* Verhoeff, 1898 | er |
| * | *Cylindroiulus truncorum* (Silvestri, 1896) | vr |
| ♦ | *Cylindroiulus vulnerarius* (Berlese, 1888) ~ | ? |

| Diplopoda | | |
|---|---|---|
| **Red List status** | **Species** | **Frequency of occurrence** |
| EU | *Cylindroiulus zinalensis* (Faes, 1902) | vr |
| * | *Dendromonomeron oribates* (Latzel, 1884) | vr |
| * | *Enantiulus nanus* (Latzel, 1884) | mf |
| * | *Geoglomeris subterranea* Verhoeff, 1908 | vr |
| 2 | *Glomeridella minima* (Latzel, 1884) | er |
| * | *Glomeris connexa* C. L. Koch, 1847 | vr |
| 2 | *Glomeris helvetica* (Verhoeff, 1894) | er |
| * | *Glomeris hexasticha* Brandt, 1833 | f |
| * | *Glomeris intermedia* Latzel, 1884 | mf |
| 2 | *Glomeris malmivaga* (Verhoeff, 1912) + | er |
| * | *Glomeris marginata* (Villers, 1789) | f |
| * | *Glomeris pustulata* Latreille, 1804 | r |
| * | *Glomeris tetrasticha* Brandt, 1833 | r |
| 3 | *Glomeris transalpina* C. L. Koch, 1836 | vr |
| * | *Glomeris undulata* C. L. Koch, 1844 | mf |
| * | *Haasea flavescens* (Latzel, 1884) | vr |
| 2 | *Haasea germanica* (Verhoeff, 1901) | er |
| 2 | *Haasea norica* (Verhoeff, 1913) | er |
| 2 | *Halleinosoma noricum* Verhoeff, 1913 | er |
| R | *Haploporatia eremita* (Verhoeff, 1909) | er |
| NT | *Hypsoiulus alpivagus* (Verhoeff, 1897) | r |
| * | *Iulogona tirolensis* (Verhoeff, 1894) | vr |
| * | *Julus scandinavicus* Latzel, 1884 | vf |
| * | *Julus scanicus* Lohmander, 1925 | r |
| * | *Julus terrestris* Porat, 1889 | vr |
| * | *Kryphioiulus occultus* (C. L. Koch, 1847) | mf |
| R | *Leptoiulus alemannicus* (Verhoeff, 1892) | er |
| * | *Leptoiulus belgicus* (Latzel, 1884) | mf |
| * | *Leptoiulus bertkaui* (Verhoeff, 1896) | vr |
| * | *Leptoiulus cibdellus* (Chamberlin, 1921) | vr |
| R | *Leptoiulus kervillei* (Brölemann, 1896) | er |
| R | *Leptoiulus marcomannius* Verhoeff, 1913 | er |
| 2 | *Leptoiulus montivagus* (Latzel, 1884) | er |
| R | *Leptoiulus noricus* Verhoeff, 1913 | er |
| * | *Leptoiulus proximus* (Němec, 1896) | f |
| * | *Leptoiulus saltuvagus* (Verhoeff, 1898) | vr |
| * | *Leptoiulus simplex* (Verhoeff, 1894) | r |
| R | *Leptoiulus trilobatus* (Verhoeff, 1894) | er |
| 2 | *Listrocheiritium cervinum* Verhoeff, 1925 | er |
| * | *Macrosternodesmus palicola* Brölemann, 1908 | vr |
| NT | *Mastigona bosniense* (Verhoeff, 1897) | r |
| * | *Mastigona mutabile* (Latzel, 1884) | r |
| 2 | *Mastigophorophyllon saxonicum* Verhoeff, 1910 | er |
| * | *Megaphyllum projectum* (Verhoeff, 1894) | mf |
| NT | *Megaphyllum unilineatum* (C. L. Koch, 1838) | mf |

| Diplopoda | | |
|---|---|---|
| **Red List status** | **Species** | **Frequency of occurrence** |
| * | *Melogona gallica* (Latzel, 1884) | r |
| R | *Melogona transsilvanica* (Verhoeff, 1897) | er |
| * | *Melogona voigti* (Verhoeff, 1899) | f |
| ♦ | *Mesoiulus gridellii* Strasser, 1934 ~ | ? |
| * | *Mycogona germanica* (Verhoeff, 1892) | f |
| ♦ | *Nanogona polydesmoides* (Leach, 1815) ~ | ? |
| * | *Nemasoma varicorne* C. L. Koch, 1844 | mf |
| * | *Nopoiulus kochii* (Gervais, 1847) | mf |
| R | *Ochogona brentana* (Verhoeff, 1928) | er |
| * | *Ochogona caroli* (Rothenbühler, 1900) | mf |
| 2 | *Ochogona regale* (Verhoeff, 1913) | er |
| 2 | *Ommatoiulus rutilans* (C. L. Koch, 1847) | vr |
| * | *Ommatoiulus sabulosus* (Linnaeus, 1758) | vf |
| R | *Ommatoiulus vilnense* Jawlowski, 1925 | er |
| * | *Ophiodesmus albonanus* (Latzel, 1895) | vr |
| ♦ | *Ophyiulus germanicus* (Verhoeff 1896) ~ | ? |
| * | *Ophyiulus major* (Verhoeff, 1928) | vr |
| 2 | *Ophyiulus nigrofuscus* (Verhoeff, 1894) | er |
| * | *Ophyiulus pilosus* (Newport, 1842) | f |
| R | *Orthochordeumella fulva* (Rothenbühler, 1899) | er |
| D | *Orthochordeumella pallida* (Rothenbühler, 1899) | vr |
| ♦ | *Oxidus gracilis* (C. L. Koch, 1847) ~ | ? |
| * | *Pachypodoiulus eurypus* (Attems, 1895) | vr |
| ♦ | *Paraspirobolus lucifugus* (Gervais, 1836) ~ | ? |
| * | *Polydesmus angustus* (Latzel, 1884) | f |
| * | *Polydesmus complanatus complanatus* (Linnaeus, 1761) | mf |
| * | *Polydesmus complanatus illyricus* (Verhoeff, 1893) | mf |
| * | *Polydesmus denticulatus* C. L. Koch, 1847 | vf |
| 1 | *Polydesmus edentulus* C.L. Koch, 1847 | er |
| * | *Polydesmus inconstans* Latzel, 1884 | mf |
| R | *Polydesmus monticola* Latzel, 1884 | er |
| 1 | *Polydesmus susatensis* Verhoeff, 1934 | er |
| * | *Polyxenus lagurus* (Linnaeus, 1758) | mf |
| * | *Polyzonium germanicum* Brandt, 1831 | mf |
| ♦ | *Poratia digitata* (Porat, 1889) ~ | ? |
| ♦ | *Poratia obliterata* (Kraus, 1960) ~ | ? |
| 2 | *Propolydesmus germanicus* (Verhoeff, 1896) | er |
| * | *Propolydesmus helveticus* (Verhoeff, 1894) | vr |
| * | *Propolydesmus testaceus* (C. L. Koch, 1847) | mf |
| ♦ | *Prosopodesmus jacobsoni* Silvestri, 1910 ~ | ? |
| * | *Proteroiulus fuscus* (Am Stein, 1857) | mf |
| 3 | *Pseudocraspedosoma grypischium* (Rothenbühler, 1900) | vr |
| R | *Pteridoiulus aspidiorum* Verhoeff, 1913 | er |
| 2 | *Pyrgocyphosoma titianum* (Verhoeff, 1910) + | er |
| ♦ | *Rhinotus purpureus* (Pocock, 1894) ~ | ? |

| Diplopoda | | |
|---|---|---|
| **Red List status** | **Species** | **Frequency of occurrence** |
| 3 | *Rhymogona montivaga alemannica* (Verhoeff, 1910) | vr |
| 3 | *Rhymogona montivaga cervina* (Verhoeff, 1910) | vr |
| 1 | *Rhymogona serrata* (Bigler, 1912) + | er |
| 2 | *Rhymogona verhoeffi* (Bigler, 1913) + | er |
| 2 | *Rhymogona wehrana* (Verhoeff, 1910) + | er |
| ♦ | *Stosatea italica* (Latzel, 1886) ~ | ? |
| * | *Strongylosoma stigmatosum* (Eichwald, 1830) | r |
| * | *Tachypodoiulus niger* (Leach, 1815) | vf |
| R | *Trachysphaera costata* (Waga, 1857) | er |
| R | *Trachysphaera gibbula* (Latzel, 1884) | er |
| R | *Trachysphaera schmidti* (Heller, 1858) | er |
| 1 | *Typhloiulus seewaldi* (Strasser, 1967) | er |
| * | *Unciger foetidus* (C. L. Koch, 1838) | vf |
| * | *Xestoiulus laeticollis* (Porat, 1889) | r |
| 2 | *Xylophageuma vomrathi* Verhoeff, 1911 + | er |

| Chilopoda | | |
|---|---|---|
| **Red List status** | **Name** | **Frequency of occurrence** |
| 1 | *Clinopodes flavidus* C. L. Koch, 1847 | er |
| ♦ | *Cryptops anomalans* Newport, 1844 ~ | ? |
| * | *Cryptops hortensis* (Donovan, 1810) | r |
| * | *Cryptops parisi* Brölemann, 1920 | mf |
| 1 | *Eupolybothrus grossipes* (C. L. Koch, 1847) | er |
| * | *Eupolybothrus tridentinus* (Fanzago, 1874 | r |
| * | *Geophilus alpinus* Meinert, 1870 | r |
| 1 | *Geophilus carpophagus* Leach, 1815 | er |
| * | *Geophilus electricus* (Linnaeus, 1758) | r |
| * | *Geophilus flavus* (De Geer, 1778) | vf |
| R | *Geophilus oligopus (Attems, 1895)* | er |
| ♦ | *Geophilus osquidatum* Brölemann, 1909 ~ | ? |
| 1 | *Geophilus proximus* C. L. Koch, 1847 | er |
| 1 | *Geophilus pygmaeus* Latzel, 1880 | er |
| R | *Geophilus rhenanus* (Verhoeff, 1895) | er |
| * | *Geophilus studeri* Rothenbühler, 1899 | vr |
| * | *Geophilus truncorum* (Bergsoe & Meinert, 1866) | vr |
| R | *Harpolithobius anodus* (Latzel, 1880) | er |
| ♦ | *Henia brevis* (Silvestri, 1896) ~ | ? |
| NT | *Henia vesuviana* (Newport, 1844) | vr |
| ♦ | *Lamyctes emarginatus* (Newport, 1844) ~ | ? |
| * | *Lithobius aeruginosus* L. Koch, 1862 | mf |
| * | *Lithobius agilis* C. L. Koch, 1847 | r |
| * | *Lithobius austriacus* L. Koch, 1862 | vr |
| * | *Lithobius borealis* Meinert, 1868 | r |

**Chilopoda**

| Red List status | Name | Frequency of occurrence |
|---|---|---|
| * | *Lithobius calcaratus* C. L. Koch, 1844 | vf |
| * | *Lithobius crassipes* L. Koch, 1862 | vf |
| * | *Lithobius curtipes* C. L. Koch, 1847 | mf |
| * | *Lithobius dentatus* C. L. Koch, 1844 | h |
| * | *Lithobius erythrocephalus* C. L. Koch, 1847 | r |
| * | *Lithobius forficatus* (Linnaeus, 1758) | vf |
| R | *Lithobius glacialis* Verhoeff, 1937 | er |
| R | *Lithobius lapidicola* Meinert, 1872 | er |
| R | *Lithobius latro* Meinert, 1872 | er |
| * | *Lithobius lucifugus* L. Koch, 1862 | r |
| * | *Lithobius macilentus* L. Koch, 1862 | mf |
| NT | *Lithobius melanops* Newport, 1845 | r |
| * | *Lithobius microps* Meinert, 1868 | f |
| * | *Lithobius mutabilis* L. Koch, 1862 | vf |
| * | *Lithobius muticus* C. L. Koch, 1847 | mf |
| * | *Lithobius nodulipes* Latzel, 1880 | mf |
| * | *Lithobius pelidnus* Haase, 1880 | r |
| * | *Lithobius piceus* L. Koch, 1862 | f |
| 1 | *Lithobius punctulatus* C. L. Koch, 1847 | er |
| * | *Lithobius pygmaeus* Latzel, 1880 | vr |
| * | *Lithobius subtilis* Latzel, 1880 | vr |
| * | *Lithobius tenebrosus* Meinert, 1872 | mf |
| * | *Lithobius tricuspis* Meinert, 1872 | mf |
| * | *Lithobius valesiacus* (Verhoeff, 1935) | r |
| ♦ | *Mecistocephalus maxillaris* (Gervais, 1837) ~ | ? |
| 2 | *Pachymerium ferrugineum* (C. L. Koch, 1835) | vr |
| * | *Schendyla nemorensis* (C. L. Koch, 1837) | h |
| R | *Schendyla tyrolensis* (Meinert, 1870) | er |
| ♦ | *Scolopendra cingulata* Latreille, 1829 ~ | er |
| ♦ | *Scutigera coleoptrata* (Linnaeus, 1758) ~ | ? |
| ♦ | *Stenotaenia linearis* (C. L. Koch, 1835) ~ | ? |
| * | *Stigmatogaster subterranea* (Shaw, 1789) | vr |
| * | *Strigamia acuminata* (Leach, 1814) | f |
| * | *Strigamia crassipes* (C. L. Koch, 1835) | mf |
| 1 | *Strigamia maritima* (Leach, 1815) | er |
| * | *Strigamia transsilvanica* (Verhoeff, 1928) | vr |